June 22, 1971 G. G. SIMOR 3,585,723

DENTAL CROWN AND METHOD OF INSTALLATION THEREOF

Filed June 20, 1969 4 Sheets-Sheet 1

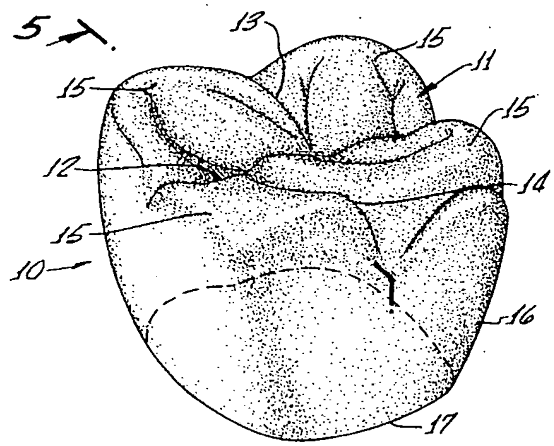

FIG. 1.

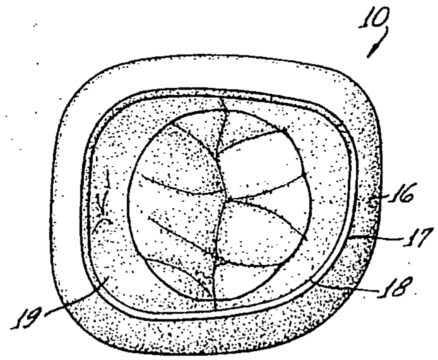

FIG. 2.

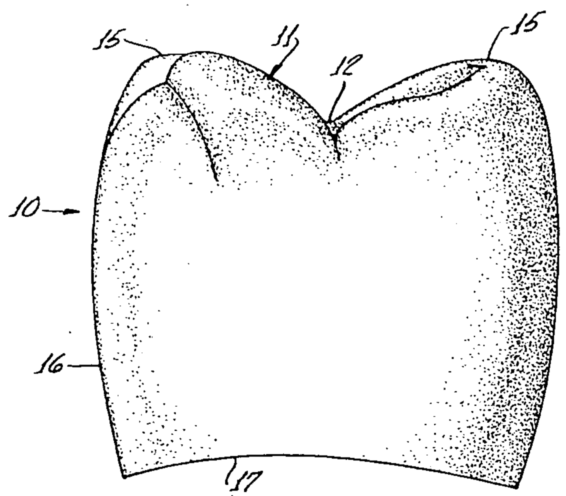

FIG. 3.

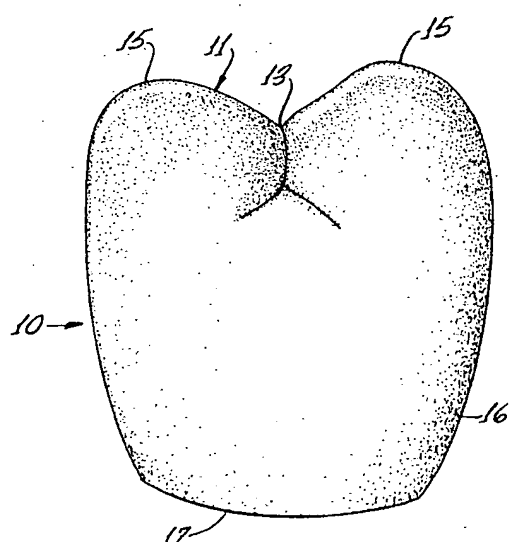

FIG. 4.

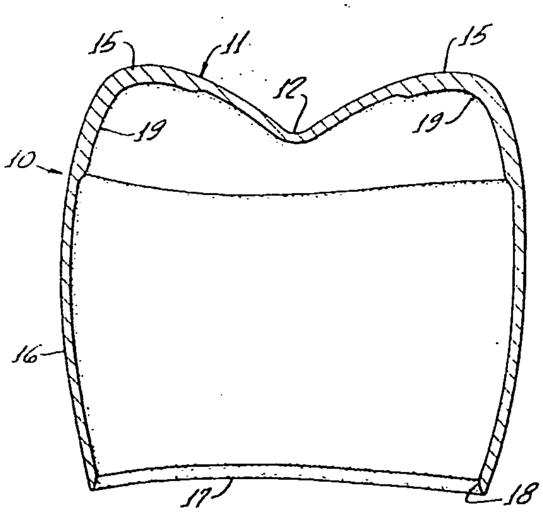

FIG. 5.

INVENTOR.
GEORGE G. SIMOR

BY

ATTORNEYS.

DENTAL CROWN AND METHOD OF INSTALLATION THEREOF

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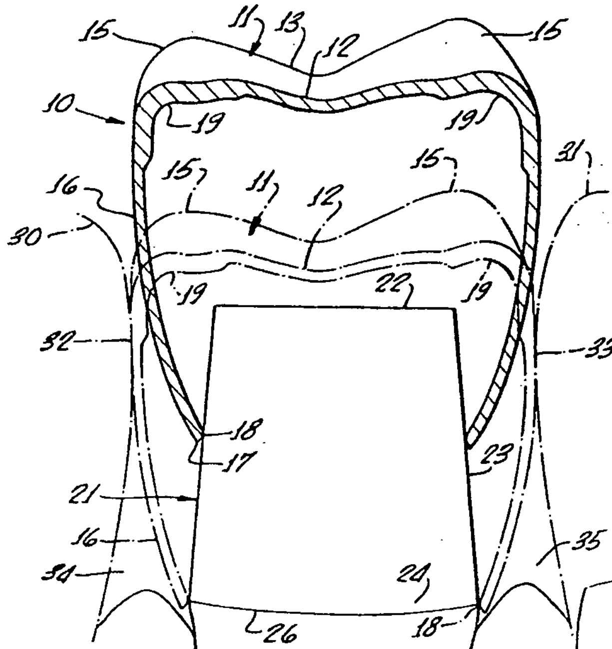

FIG. 8.

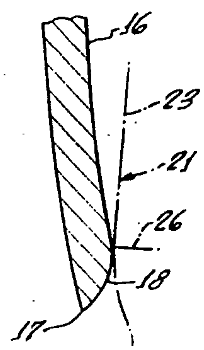

FIG. 6.

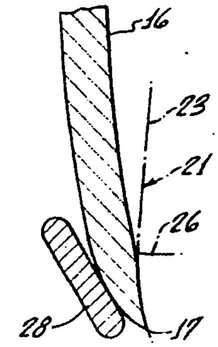

FIG. 11.

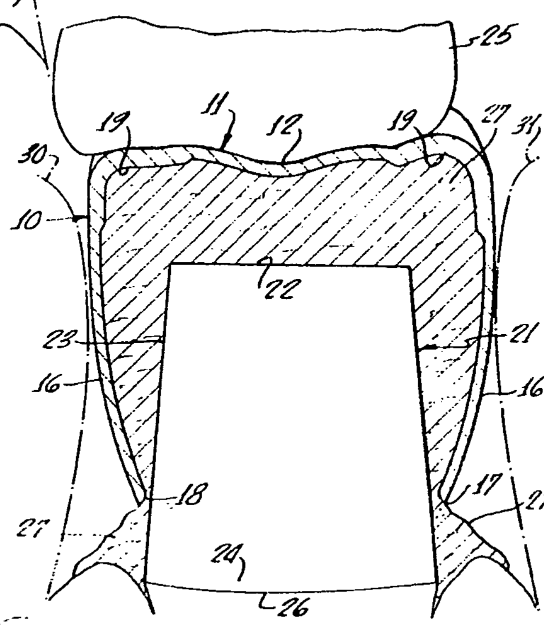

FIG. 9.

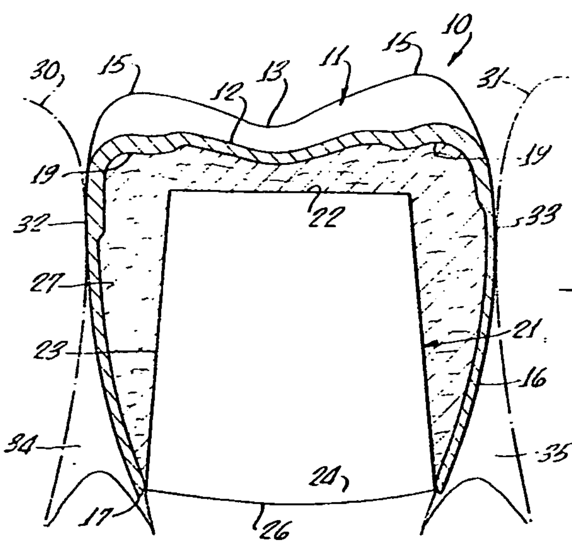

FIG. 10.

INVENTOR.
GEORGE G. SIMOR

BY

Jancourtz & Ross

ATTORNEYS.

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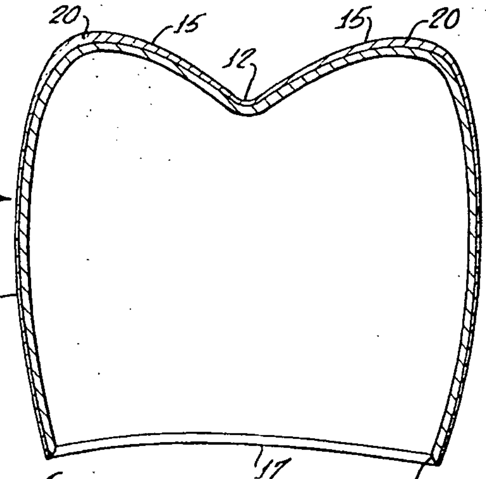

FIG. 7.

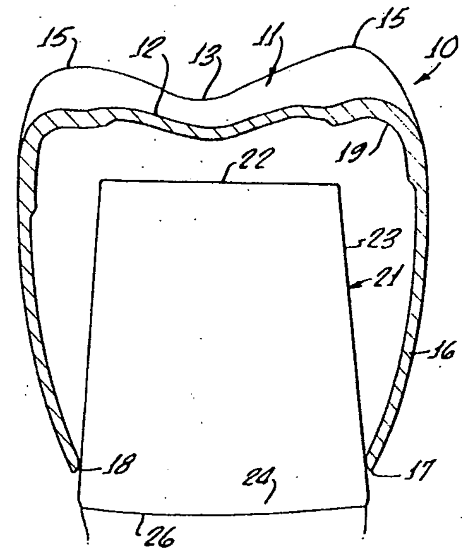

FIG. 12.

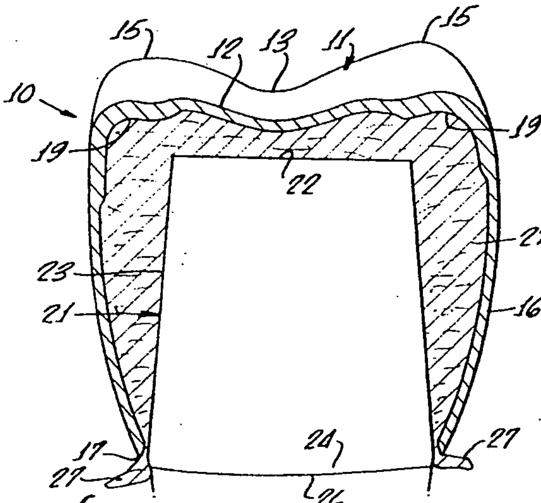

FIG. 13.

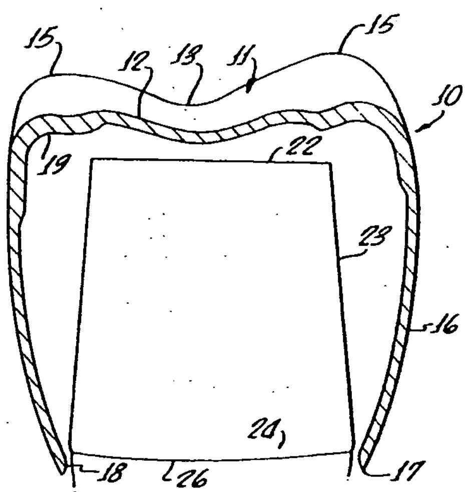

FIG. 14

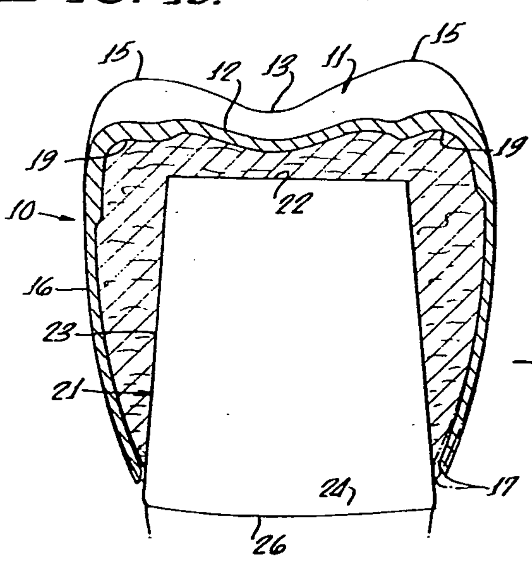

FIG. 15.

INVENTOR.
GEORGE G. SIMOR
BY
ATTORNEYS.

DENTAL CROWN AND METHOD OF INSTALLATION THEREOF

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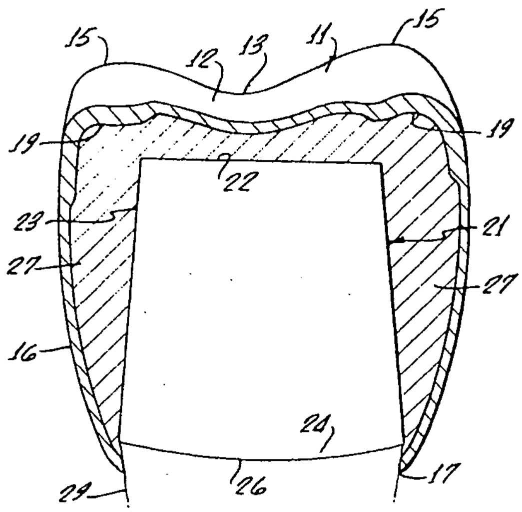

FIG. 16.

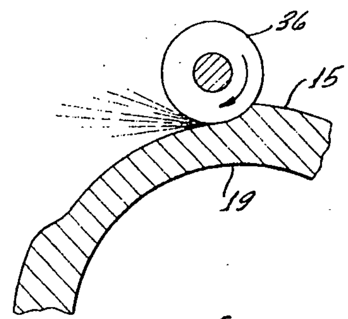

FIG. 17.

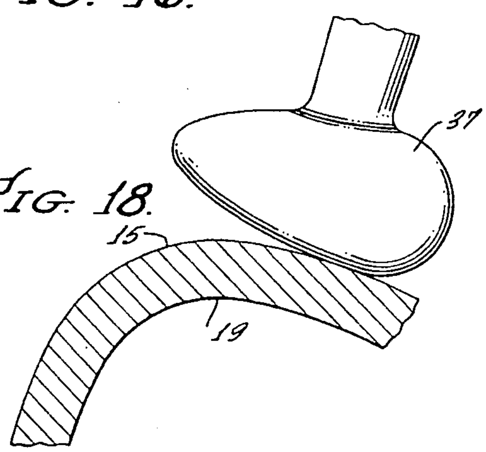

FIG. 18.

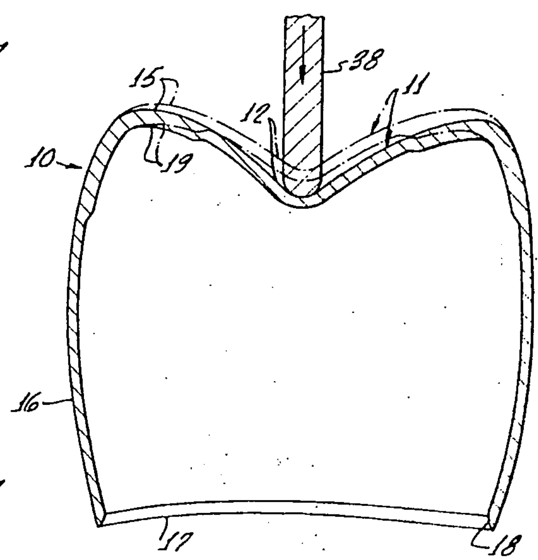

FIG. 19.

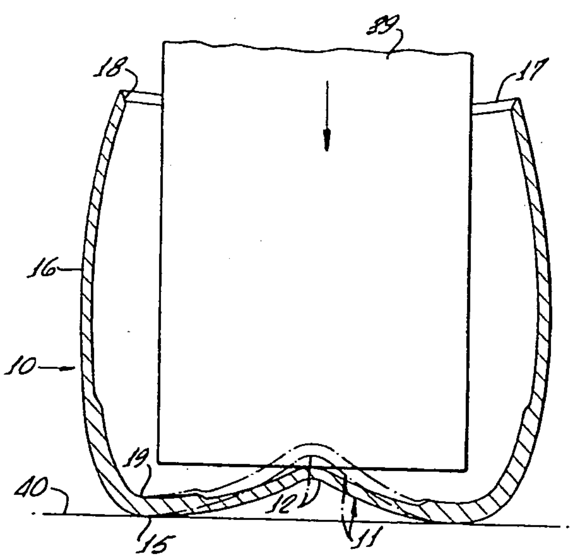

FIG. 20.

INVENTOR.
GEORGE G. SIMOR

BY

Jancsaitis & Kern

ATTORNEYS.

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Patented June 22, 1971

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3,585,723

DENTAL CROWN AND METHOD OF INSTALLATION THEREOF

George G. Simor, Santa Ana, Calif., assignor to The Ion Company, Costa Mesa, Calif.

Filed June 20, 1969, Ser. No. 835,181
Int. Cl. A61c 5/08
U.S. Cl. 32—12 34 Claims

ABSTRACT OF THE DISCLOSURE

The dental crown of this invention includes an occlusal surface and a sidewall that tapers in cross section toward a restricted opening at the cervix, where there is a rounded inner corner. The central groove at the occlusal surface has sharp convergence and a thin wall at its base, allowing the depth of the groove to be varied, while the cusps of the occlusal surface have a thickened wall. The crown is installed by pushing it onto the prepared tooth to expand the cervix and cause it to become complementary to the cervical end of the tooth. After this, the crown is removed, an excess of cement is introduced into its interior, and it is replaced on the tooth, after which the cervical corner is burnished to form a feather edge where the tooth is engaged.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to crowns for dental use.

The prior art

It has become recognized that a properly fitted temporary crown is of vital importance, as critical as the later-applied permanent crown. When a tooth has been prepared for receiving a permanent crown, the grinding performed on the tooth will have placed it in a condition of shock. Unless protected appropriately by a temporary crown, it is vulnerable to subsequent damage, which can lead to ultimate loss of the tooth.

The conventional temporary crown is a shell of thin metal forming a cup with a closed end having a surface roughly approximating the occlusal area of a tooth. From the closed end, the crown extends as a tube of constant or increasing cross section to its open opposite end. The crown is attached to a prepared tooth by cement in the space between the tooth and the crown when the crown is positioned over the tooth. These temporary crowns do not correspond in shape to the teeth to which they are applied, so that prior to installation the shape of the temporary crown must be altered by the dentist in an effort to make it fit the tooth. In most instances, the crown is too long for the tooth, and must be trimmed along its cervical edge to a dimension appropriate for the height of the tooth to which it is to be applied. Also, the open end of the crown must be festooned as it is trimmed to more-or-less correspond to the contour of the gum line. In addition, the open end of the crown is crimped inwardly to reduce its lateral dimension and provide a configuration similar to that of the cervical end of the tooth. This contouring is a difficult operation to perform without causing folds in the material of the crown. In any event, the material of the crown never can be gathered in sufficiently to produce a close fit with the tooth. As a result, there is a projecting edge at the cervix of the crown that is irritating to the gum tissue and uncomfortable to the patient. Also, the crown is not securely anchored during the period in which the cement remains in a fluid condition because the poorly fitting crown allows the cement to run out. Most cements do not reach ultimate strength for 48 hours, and some are of a non-hardening variety. Therefore, during initial mastication, the crown is easily driven further onto the tooth, forcing it into the area of the attached gingiva. This is injurious to the gum tissue, and endangers the life of the prepared tooth and of the adjacent teeth. In addition, it places the level of the occlusal surface of the crown beneath that of the adjoining teeth, causing a hypo-occlusion. Therefore, the tooth subsequently receives no pressure during occlusion. Under these conditions, the tooth will erupt from its original position, or the opposing tooth will drift toward the tooth with the crown. In some cases, both the tooth with the crown and the opposing occlusion may experience such movement. Later, therefore, when the permanent crown is applied to the tooth, it will not occupy the same position relative to the opposing tooth that it originally was made for, causing a hyper-occlusion. In many cases, the permanent crown is not adapted to be ground down to alleviate this without unduly weakening or perforating it. Hence, unless the healthy opposing tooth is ground shorter, the treated tooth will receive abnormally high pressures during occlusion and mastication, which can cause severe injury.

The crown design, installation procedures and lack of a rigid support for the crown also result frequently in imperfect mating with the opposing occlusion. It is difficult for the dentist to align the occlusal surface of the temporary crown with that of the opposing tooth, so that when the patient bites, the crown may be engaged at only one point. Driving the crown further onto the tooth during occlusion or mastication will not improve this situation as there is no means for realigning the occlusal surface as this occurs. In some instances, the crown becomes worn completely through due to the continued concentration of opposing pressures at the localized area of contact. The lack of a proper fit also can result in the crown's becoming cocked and further misaligned from the forces applied to its occlusal surface.

In order for the permanent crown to fit properly, it is necessary that the temporary crown engage the adjacent teeth. Otherwise, the adjacent teeth will drift inwardly, making the space between them more narrow. To guard against this, temporary crowns are selected to have a mesio-distal dimension that is equal to or slightly greater than that of the space between the adjacent teeth, so that they will abut the adjacent teeth and hold them in position. When the crown has a greater dimension than the spacing between the adjacent teeth, its periphery engages the adjoining teeth as the crown is placed on the prepared tooth. As the crown then is pushed into position, the wall of the crown slides along the points of contact with the adjacent teeth for nearly the full height of the crown. The result is the production of grooves in the mesial and distal surfaces of the crown. These grooves provide recesses for the accumulation of food particles. Being concave, they retain the particles and prevent them from being washed or brushed away, promoting an unhealthy condition for the prepared and adjacent teeth and the gums. As a result, the lives of the prepared and adjacent teeth are endangered, Even where the crown is of a size no larger than the space between the adjacent teeth so that no grooves are formed in it, the straight sides of the crown mean that only a small gap exists between the crown and each adjacent tooth. Again, food particles are accumulated and resist washing or brushing away.

While the occlusal surfaces of conventional temporary crowns approximate those of actual teeth, they will not normally correspond exactly to the anatomy of the other teeth within the mouth. This difference in anatomy between that of the crown and of the remaining teeth may cause the tooth to which the crown has been applied to receive improper pressures during occlusion and as chewing takes place. There has been no satisfactory way of

altering the contour of the occlusal portion of the ordinary temporary crown. Grinding is impossible, as this immediately will cut through the thin wall of the temporary crown.

SUMMARY OF THE INVENTION

The present invention provides a greatly improved dental crown, usable for both temporary and permanent purposes. It is made of a cup-shaped member of a deformable material which is not subject to galvanic action within the media of the mouth. Instead of having a straight or divergent sidewall as in the conventional crown, it is provided with a restricted cervix so that the sidewall flares outwardly toward the occlusal area as in a natural tooth. A rounded inside corner is provided at the edge of the cervix of the crown. The crown is proportioned in all its dimensions to correspond to the configuration of a natural tooth. Its cervical end is contoured to rise and fall in the pattern of the cemento-enamel junction of an average tooth.

In use of the crown, it is first placed over the prepared tooth and pushed toward the cervical end of the tooth. As this is done, the cervix of the crown, which is narrower than the intermediate portion of the wall of the tooth, is caused to expand and assume the precise contour of the cervical portion of the tooth. The rounded inner edge allows the crown to be pushed onto the tooth without its edge catching on the tooth to prevent movement. The crown then is removed and an excess of cement is applied to its interior. Next, it is again placed on the tooth and moved to where it is in the proper final position relative to the tooth. As this takes place, the excess cement is pushed outwardly through the gap at the cervix of the crown until such time as the crown reaches the desired position. After this is done, the cervical edge of the crown is burnished over to form a smooth transition from the surface of the tooth to that of the crown without any irritating projecting portion. The tight fit of the cervix of the crown with the cervical end of the tooth seals the cement within the space between the tooth and the inside of the crown. This provides a hydraulic lock which precludes further movement of the crown onto the tooth. As a consequence, the crown is retained exactly in the desired location.

The occlusal portion of the crown is provided with a central groove that is sharply convergent at its base. This allows the anatomy of the crown to be varied to suit the characteristics of the teeth of the patient. The central groove may be made more shallow by pressing outwardly on the inner part of the groove. Applying a blade to the outside of the base the central groove will deepen it. This operation normally is carried out after the initial removal of the crown from the tooth and before the cement is applied.

The crown is made with a thickened wall at the cusps of the occlusal surface, which allows it to be fitted more precisely upon installation. The thickened cusps permit the crown to be ground down where needed, providing enough metal to accommodate the grinding without cutting through the wall of the crown. The cusps also may be burnished to vary the anatomy of the crown as needed.

The crown of this invention is advantageous as a temporary crown in properly protecting the teeth during the interval between preparation of the tooth and the installation of the permanent crown. It also may be used as a permanent crown, avoiding the laborious, time-consuming and expensive process of casting a permanent crown to the necessary shape. A suitable material, such as gold, may be used for the permanent crown, while the temporary crown normally will be of a different material, such as a tin alloy. Other noncorrosive metals and plastics also may be used.

An object of this invention is to provide an improved arrangement for dental crowns.

Another object of this invention is to provide a dental

crown which will avoid damage to the tooth and surrounding tissue.

A further object of this invention is to provide a crown which will be positioned against movement prior to solidification of the cement used to attach it to the tooth.

An additional object of this invention is to provide a crown having provision for change in its occlusal anatomy.

A still further object of this invention is to provide a type of crown usable both temporarily and permanently.

An additional object of this invention is to provide a crown that provides an adequate gap at the adjacent teeth so that food particles are not accumulated.

Yet another object of this invention is to provide a crown which provides localized contact with adjacent teeth, and does not result in the creation of recesses for accumulation of food particles between the crown and the adjacent teeth.

These and other objects will become apparent from the following detailed description taken in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of the crown of this invention;

FIG. 2 is a bottom plan view of the crown;

FIG. 3 is a side elevational view of the crown, taken from the mesial side;

FIG. 4 is a side elevational view of the crown, taken from the buccal side;

FIG. 5 is a sectional view of the crown taken along line 5—5 of FIG. 1;

FIG. 6 is an enlarged fragmentary sectional view illustrating the contour of the edge of the crown at its cervix;

FIG. 7 is an enlarged fragmentary sectional view illustrating the thickened cusp wall when plated material is used;

FIG. 8 is a sectional view illustrating the first step in one procedure for installing the crown;

FIG. 9 is a view similar to FIG. 8 showing the crown during an intermediate step in its installation;

FIG. 10 is a sectional view showing the crown in the installed position;

FIG. 11 is an enlarged fragmentary sectional view illustrating the manner in which the cervical edge of the crown is burnished upon installation;

FIG. 12 is a sectional view showing the first step in a variation of the installation procedure;

FIG. 13 is a sectional view showing a subsequent step of the installation;

FIG. 14 is a sectional view illustrating the first step of a third installation technique;

FIG. 15 is a sectional view of a subsequent step of the installation by the third technique;

FIG. 16 is a sectional view showing the manner in which the crown is locked onto the tooth when the cervix of the crown is extended past the cervical line of the tooth;

FIG. 17 is an enlarged fragmentary sectional view illustrating the grinding of a cusp of the crown to vary its anatomy;

FIG. 18 is an enlarged fragmentary sectional view illustrating the changing of the crown anatomy by burnishing;

FIG. 19 is a sectional view showing how the central groove may be deepened; and

FIG. 20 is a sectional view illustrating the way in which the central groove is made more shallow.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The crown **10** of this invention is a cuplike metal shell having an exterior periphery resembling that of a typical tooth at the portion of the mouth where the crown is to be used. The crown **10** illustrated is for posterior teeth, but it may be made to fit any other teeth. It is made of a deformable material which is substantially chemically inert with respect to the media of the mouth, such as various

noncorrosive metals or plastic, to avoid possible galvanic action. For a temporary crown, a tin alloy of approximately 99% tin and 1% silver is particularly satisfactory. For a permanent crown, gold or other suitable material may be used. The crown may include a plated exterior surface in some instances.

The crown **10** includes an outer end wall contoured to define an occlusal surface **11** that includes a central groove **12**, as well as buccal and lingual developmental grooves **13** and **14** separating cusps **15**. A continuous sidewall **16** extends from a location of maximum lateral dimension adjacent the occlusal surface **11** to the cervix **17** at the open opposite end of the crown. Thus, there is a relatively narrow opening at the cervix **17**, and the sidewall **16** flares outwardly on all sides of the crown toward the occlusal portion **11**. The sidewall **16** throughout most of its length is of constant thickness, but the inside corner **18** of this wall at the cervix **17** is provided with a convex rounded shape. The rounded edge **18**, therefore, tapers outwardly from the inner surface of the sidewall **16** to the outer surface of this wall, as may best be seen in the enlarged illustration of FIG. 6.

The cervix **17** also is contoured similarly to the cemento-enamel junction of an average tooth at the location where the crown is to be used. Thus, on the mesial and distal sides, the cervix **17** of the crown illustrated is inclined convexly upwardly, while on the buccal and lingual sides it is curved downwardly (see FIGS. 3 and 4). Moreover, the proportions of height and width of the crown in various directions are the same as typically found in corresponding human teeth. Therefore, while the cervix **17** is slightly narrower than the cervical end of an average tooth, in all other respects the configuration of the crown conforms very closely to the anatomy of the average tooth for which it is intended.

In the area of the cusps **15** of the occlusal portion **11** of the crown **10**, the inner wall surface **19** is inwardly displaced to provide a greater wall thickness, as seen in FIG. 5. At the location of the central grove **12**, however, the crown has a relatively thin wall. There is a sharp convergence at the base of the central groove **12**. When the crown **10** is of plated construction, the thickened cusps may be produced by depositing added material **20** on the exteriors of the cusp areas, as shown in FIG. 7, rather than displacing the inner wall as in the embodiment of FIG. 5.

In use of the crown **10** of this invention, the tooth is prepared in the customary manner. Thus, as shown in FIG. 8, the tooth **21** has been ground down so that its occlusal surface **22** is below its previous level, and the side portion **23** of the tooth is reduced from its original lateral dimension. The side **23** is convergent from the cervical end toward the occlusal surface **22**.

The crown **10** is made in a variety of sizes so that the proper configuration may be selected for a particular location. The cervix **17** of the crown **10** to be applied to the tooth **21** is narrower than the lateral dimension of the cervical end **24** of the prepared tooth **21**, but larger than the occlusal surface **22**. Thus, the inner corner **18** of the crown **10** will engage an intermediate portion of the tooth surface **23** when the crown **10** initially is applied to the tooth, as indicated in solid lines in FIG. 8.

By one procedure that may be followed, the first step is to press the crown **10** onto the tooth **21** to the position indicated in phantom lines in FIG. 8. This preferably is accomplished through the biting of the patient to force the crown onto the prepared tooth **21** by the opposing tooth **25**, as indicated in FIG. 9. This locates the crown at the desired height relative to the tooth for the final attachment of the crown. At that position, the crown **10** is in proper relationship with the other teeth of the patient. In the example shown, the cervix **17** of the crown is approximately at the finish line **26** of the tooth preparation, which is, in turn, usually around the cemento-enamel junction.

As the crown **10** is pushed downwardly from the initial

position of engagement with the tooth **21** to the second location of desired height, the inner corner **18** at the cervix **17** slides along the tooth surface **23**. Because the corner **18** is outwardly inclined and rounded, it readily slides along the tooth surface **23** without catching to prevent movement. Pushing the crown **10** from the position of solid lines in FIG. 8 to that of the phantom lines causes the cervix **17** to become expanded in lateral dimension. This results from the fact that it is moved toward the cervical end **24** of the tooth, which is of increased dimension. When the crown **10** is of a malleable material, such as a tin alloy, this expansion of the cervix takes place readily, and the cervix retains the expanded shape given to it. This contour of the cervix **17** is complementary to the cervical end **24** of the prepared tooth **21**. Therefore, at the location where the crown is positioned properly relative to the tooth, the cervix **17** of the crown fits closely around the cervical tooth end **24**, while the remaining portions of the crown are spaced from the tooth.

After this first operation, the crown **10** is removed from the tooth **21**. Next, a quantity of cement **27** is introduced into the interior of the crown. A little more cement **27** is inserted into the crown **10** than is required in securing the crown to the tooth. After this, the crown **10** is placed back on the tooth and moved toward the cervical end **24** until it reaches the desired position. Ultimately, therefore, the crown assumes the position shown in FIG. 10, which is the same location relative to the tooth as that illustrated in phantom in FIG. 8. As the crown **10** is shifted toward the position of FIG. 10, excess cement will be displaced from the interior of the crown through the gap between the cervix **17** and the wall **23** of the tooth (see FIG. 9). However, when the desired position of the crown **10** is reached, the cervical corner **18** of the crown comes into contact with the wall **23** of the tooth. This is intimate contact in view of the fact that the cervix of the crown previously was expanded to achieve the precise contour of the tooth wall. Therefore, when the crown **10** reaches the position of FIG. 10 and engagement is made with the tooth, the remaining cement **27** is trapped within the crown. It cannot run out at the cervix of the crown **10** because it is confined by the engagement of the entire periphery of the cervix **17** with the tooth wall **23**. Because the cement is so retained and the space between the interior of the crown **10** and the exterior of the tooth is entirely full of cement, the downward displacement of the crown **10** is terminated when the cervix **17** of the crown engages the perimeter of the tooth. This alleviates the possibility of installing the crown too deeply on the tooth, or of pushing the crown downwardly by the opposing tooth **25** during mastication. Thus, even prior to solidification of the cement **27**, the crown is firmly retained in precisely the desired position.

After the installation of the crown **10** on the tooth **21**, the lower edge portion of the crown is burnished to bend it inwardly by means of an appropriate burnishing tool **28**, as seen in FIG. 11. This is permitted by the rounded nature of the lower inner corner **18**, which results in an overhanging portion of material which can be bent inwardly to overlie the surface **23** of the tooth. The result is a feather edge at the cervix of the crown, providing a smooth transition from the periphery of the tooth **21** to the exterior of the crown, with no shoulder or sharp edge. This facilitates the healing of the gingiva adjacent the tooth **21**, and is more comfortable to the patient.

In a variation in the procedure for attaching the crown **10**, it is initially pushed onto the tooth **21** to a position, as shown in FIG. 12, where it is slightly above where it will be when finally attached. Then the crown is removed, as before, and an excess of cement **27** introduced into it. After this, the crown is again placed on the tooth **21**. The patient then bites to cause the opposing occlusion **25** to shift the crown further onto the tooth to its final position. This movement of the crown is resisted by the

cement within the crown confined by the cervix **17** at the periphery of the tooth **21**. However, if sufficient force is applied, the cervix **17** will expand slightly to allow an additional quantity of cement to escape through a narrow gap around the tooth, as seen in FIG. 13, so that the crown can be moved. After the crown has reached its final position, the cervix **17** then is burnished inwardly as before, creating the feather edge at the surface of the tooth **21**. While the cervix **17** is made a little larger than the tooth when the crown is forced downwardly to its final position, the difference in dimension is very small. Hence, the burnishing will bring the cervix **17** into intimate contact with the surface of the tooth and effectively confine the remainder of the cement **27**.

Another technique in securing the crown **10** is to first force it onto the tooth **21** slightly farther that the desired final position as shown in FIG. 14. The crown then is removed and an excess of cement **27** is applied to its interior. Next, the crown is placed back on the tooth and moved to the desired final position, illustrated in FIG. 15, preferably by the biting action of the patient. When so positioned, there is a narrow gap between the cervix **17** and the wall **23** of the tooth **21** because of the previous exansion of the cervix in initially moving it farther onto the tooth. As the crown **10** is shifted to the desired location, the cement **27** within the crown acts as a hydraulic cushion, resisting the movement of the crown. Hence, the crown **10** will be moved relatively slowly to its final position where it is supported by the viscous cement **27** between the tooth **21** and the crown. After this, the cervix **17** is burnished to make intimate contact with the tooth, producing the feather edge at the cervix. Again, only a small gap exists at the cervix prior to the burnishing, so that no difficulty is experienced in causing the cervix **17** to conform closely to the tooth and retain the cement.

Irrespective of how the crown **10** is applied to the tooth, the cervix **17** may extend below the finish line **26** of the prepared tooth. This can position the cervix **17** past the cervical line at the cemento-enamel junction, as seen in FIG. 16. The cervix **17** then is adjacent the root **29** of the tooth where the tooth is tapered in the reverse of the taper above it. When the cervix **17** is burnished inwardly under these conditions, the crown **10** becomes mechanically locked onto the tooth. This takes place because the cervix **17** is moved inwardly beneath the outward flare above the cervical line. This assists in securely holding the crown to the tooth. The same locking effect is realized without burnishing if the crown is made of a material that retains elasticity after expansion, as the cervix of the crown will then contract onto the tooth portion of smaller dimension.

The crown **10** is dimensioned and selected so that it provides a snug fit between the adjacent teeth **30** and **31** upon installation. Because the exterior of the crown **10** is convex and tapers toward the cervical end, the engagement with the adjacent teeth is over only a small area, approaching point contact. The portions of the crown between the points of contact **32** and **33** and the cervix taper inwardly so that they do not engage the adjacent teeth **30** and **31** as the crown is installed. Consequently, while the crown **10** is dimpled slightly at the points of contact **32** and **33** on the mesial and distal sides, it is not distorted beyond the points of contact toward the cervix **17**. As a result, there are appropriate gaps **34** and **35** between the crown **10** and the adjacent teeth **30** and **31** beneath the points of contact. Furthermore, the surface of the crown **10** remains convex below the points of contact, so that there are no indentations to accumulate food particles and prevent their removal, as in conventional temporary crowns.

The thickened wall portion at the cusp **15** of the occlusal surface **11** of the crown **10** provides an added advantage in permitting the crown to be ground to a precisely desired contour upon installation. The increased thickness at the occlusal portions of the crown allows material to be removed from the exterior of the crown without cutting through the wall of the crown. This effect may be seen in FIG. 17, where a grinding wheel **36** has removed a portion of the wall at the cusp **15**, but has left sufficient material so that the crown retains adequate strength. This is unlike conventional designs which have thin walls at the occlusal areas as well as elsewhere, and which cannot be ground because this would result in immediately penetrating through the wall of the crown.

Other changes in the anatomy of the crown **10** may be made by burnishing where the crown is made of malleable material. This is accomplished by engaging the occlusal surface by a suitable burnishing tool **37**, as seen in FIG. 18 deflecting the wall of the crown at a cusp **15** to adjust its shape.

A further adjustment of the anatomy of the crown is possible by virtue of the nature of the central groove **12** of the crown. The existing teeth in the mouth of the patient will have central grooves generally similar to the groove **12** of the crown **10**, but the depths of the grooves in the teeth will vary from patient to patient. Some have a relatively deep central groove in the teeth, while for others the groove may be shallow. The dentist may change the depth of the occlusal anatomy of the crown so that the central groove **12** will correspond to grooves existing in the other teeth of the patient. If a deeper groove is needed, a blade **38** is pressed into the base of the central groove **12**, pushing it inwardly (see FIG. 19). The malleable nature of the crown **10**, together with the thin wall at the central groove **12** and the sharp convergence at the base of the groove, permit the pressure of the blade **38** to bend the material of the crown to deepen the groove. As this takes place, most of the bending is localized at the base of the groove **12**, so that the overall contour of the occlusal area **11** remains generally the same, and the anatomy of the crown **10** is preserved.

The central groove **12** also may be made more shallow by pressing outwardly on the undersurface of the central groove before installation with a flat resilient element **39**, as seen in FIG. 20, such as the flat end of a rubber pencil eraser. With the occlusal surface **11** supported on a surface **40**, the effect again is to bend the crown at the convergent thin-walled area at the base of the groove **12**, with the overall anatomy of the occlusal surface remaining undisturbed. The adjustment of the depth of the central groove **12** preferably is accomplished following the removal of the crown **10** from its initial positioning on the tooth and before the cement **27** is introduced into its interior.

The proportioning of the crown **10** to correspond to the average tooth results in a better fitting crown with reduced labor on the dentist's part. The height ratio given the crown, together with the contour of the cervix **17** to correspond to the configuration of the cervical line, means that festooning of the cervix **17** at the time of installation generally is unnecessary. Even when some trimming of the crown is required, it usually is only of a minor nature that allows the correct cervical shape to be accomplished quickly and easily.

More perfect mating with the opposing occlusion results from the engagement of the crown by the opposing tooth and using the opposing tooth for moving the crown to its final position. As this engagement takes place, the occlusal surface **11** is supported by the cement beneath it which is under pressure because of the downward force on the crown. However, the cement will allow the shape of the occlusal surface **10** to be altered by the rigid opposing occlusion so that a properly mating contour is produced. The fluid cement will not rigidly support the occlusal surface **11**, so that the slight bending by the opposing occlusion may take place when the engagement is made.

I claim:

1. A dental crown comprising a cup-shaped shell of deformable material,

said shell having a closed end defining an occlusal sur-

face substantially corresponding in height and contour to the occlusal surface of a tooth,

said shell having a restricted open end, thereby providing a sidewall flaring outwardly from said open end toward said closed end,

said shell being proportioned in longitudinal and lateral dimensions and in contour to correspond generally to the anatomy of a typical human tooth,

said shell at said open end being festooned in a contour corresponding generally to the cervical line of a typical human tooth.

2. A device as recited in claim 1 in which said open end has a lateral dimension smaller than that of the cervical end of a typical human tooth.

3. A device as recited in claim 1 in which said shell at said open end is provided with an outwardly flaring inner corner deflectable inwardly to form a feather edge when said shell is positioned on a preparerd tooth.

4. A device as recited in claim 3 in which said inner corner is an arcuate convex surface.

5. A device as recited in claim 1 in which said shell at said occlusal surface includes portions having a greater wall thickness than the wall thickness of said shell remote therefrom, said sidewall of said crown being of substantially uniform wall thickness.

6. A device as recited in claim 5 in which for said portions having a greater wall thickness the inner surface of said shell is displaced inwardly.

7. A device as recited in claim 5 in which for said portions having a greater wall thickness said shell at said occlusal surface includes an additional amount of material plated thereon.

8. A device as recited in claim 1 in which said occlusal surface is provided with at least one groove therein, said groove being relatively sharply bent at the base thereof, said shell being bendable at said groove for permitting adjustment of the depth thereof.

9. A device as recited in claim 8 in which said shell at said base of said groove has less wall thickness than the wall thickness at other portions of said occlusal surface.

10. A device as recited in claim 8 in which said groove corresponds to the central groove of a human tooth, and extends across said occlusal surface substantially from one side thereof to the other.

11. A device as recited in claim 1 in which:

said shell at said occlusal surface defines cusps, said shell at said cusps having a relatively thick wall,

and said occlusal surface has a central groove therein, said central groove having a relatively sharply bent base portion having a wall thinner than said wall at said cusps,

said base portion being bendable for permitting adjustment of the depth of said central groove.

12. A device as recited in claim 1 in which said shell is of a tin alloy.

13. A device as recited in claim 12 in which said alloy consists of approximately 99% tin and 1% silver.

14. In combination with a tooth prepared for the application of a crown, a dental crown comprising a shell of deformable material extending over said tooth,

said shell having a closed end adjacent the occlusal surface of said tooth,

and an open end complementarily engaging the cervical end portion of said tooth and forming a seal therewith,

said shell at said open end being festooned in a contour corresponding generally to the cervical line of said tooth,

said shell being flared outwardly from said open end so that remaining portions of said shell are spaced outwardly away from said tooth,

and a quantity of cement substantially entirely filling the space between said shell and said tooth.

15. A device as recited in claim 14 in which said tooth is positioned between adjacent teeth, said shell engaging said adjacent teeth with localized areas of contact therewith at a location spaced outwardly from said open end.

16. A device as recited in claim 15 in which said shell flares outwardly from said open end to said areas of contact with said adjacent teeth, and is convex exteriorly between said open end and said areas of contact.

17. A device as recited in claim 14 in which

said shell at said open end tapers in wall thickness to a feather edge at said open end,

said feather edge substantially complementarily overlying said tooth at said cervical end portion thereof,

said shell having a sidewall inwardly of said feather edge which is of substantially constant wall thickness.

18. The method of providing a crown on a tooth comprising the steps of:

preparing a tooth so as to be generally convergent from the cervical end portion thereof to the occlusal surface thereof,

providing a cup-shaped member of deformable material with a closed end defining an occlusal surface and an open opposite end,

with said member being convergent adjacent said open end,

and said open end having a smaller lateral dimension than the lateral dimension of said tooth intermediate said cervical end portion and said occlusal surface of said tooth,

then pushing said member onto said tooth so that said member engages said tooth at said open end and said open end is caused to slide along the surface of said tooth toward said cervical end portion, thereby expanding said open end,

then removing said member from said tooth, then applying cement to the interior of said member, and then replacing said member on said tooth and bringing said member at said open end thereof into engagement with said tooth at said cervical end portion, thereby sealing said cement within said member.

19. The method as recited in claim 18 in which an excess of said cement is applied to the interior of said member, whereby upon said replacement of said member on said tooth the excess cement is displaced by said tooth and forced outwardly through said open end until said open end reaches said cervical end portion.

20. The method as recited in claim 18 in which

said member is moved further onto said tooth when so replaced on said tooth than when first pushed onto said tooth,

thereby causing said open end to expand slightly in forcing out a portion of said excess cement, and

in which said member at said open end is burnished inwardly into intimate contact with said tooth when said member at said open end thereof is so brought into engagement with said tooth at said cervical end portion.

21. The method as recited in claim 18 in which said member is so pushed onto said tooth further than the distance said member is moved onto said tooth when so replaced on said tooth,

whereby said cement provides a hydraulic cushion resisting the movement of said member onto said tooth upon said replacement thereof.

22. The method as recited in claim 18 in which

said member when so replaced is moved past the cemento-enamel juncture of said tooth, and

in which said member at said open end is burnished inwardly into intimate contact with said tooth past said cemento-enamel juncture when said member at said open end thereof is so brought into engagement with said tooth at said cervical end portion,

whereby said member is held on said tooth.

23. The method as recited in claim 18 in which there is an additional tooth opposing said prepared tooth, and

in which said additional tooth is used in said pushing of said member onto said tooth.

24. The method as recited in claim 18 in which there is an additional tooth opposing said prepared tooth, and in which said additional tooth is used in said moving of said member onto said tooth during said replacement of said member on said tooth.

25. The method as recited in claim 18 including in addition the step of flaring the inner corner of said open end outwardly prior to replacing said member on said tooth, and then upon said replacement of said member on said tooth bending the edge of said member inwardly at said open end so as to provide a feather edge overlying said tooth and a smooth transition from said cervical end portion of said tooth to the exterior of said member.

26. The method as recited in claim 18 in which there are additional teeth associated with said tooth, said additional teeth having occlusal surfaces differing in contour from that of said occlusal surface of said member, and including the step of varying the contour of said occlusal surface of said member to correspond more closely to said occlusal surfaces of said additional teeth.

27. The method as recited in claim 26 in which said occlusal surfaces of said member and said additional teeth have central grooves therein, said central grooves in said additional teeth being deeper than said central groove in said member, and in which for said varying the contour of said occlusal surface of said member an instrument is pressed against the base portion of said central groove of said member to bend said base portion inwardly and deepen said central groove of said member.

28. The method as recited in claim 27 in which prior to said varying the contour of said occlusal surface of said member said base portion of said central groove of said member is provided with a relatively sharp bend for facilitating said bending of said base portion by said instrument.

29. The method as recited in claim 26 in which said occlusal surfaces of said member and said additional teeth have central grooves therein, said central groove in said member being deeper than said central grooves in said additional teeth, and in which for said varying the contour of said occlusal surface of said member an instrument is pressed against the undersurface of the base of said central groove of said member to bend said base portion outwardly for causing said central groove of said member to be made more shallow.

30. The method as recited in claim 29 in which prior to said varying the contour of said occlusal surface of said member said base portion of said central groove of said member is provided with a relatively sharp bend for facilitating said bending of said base portion by said instrument.

31. The method as recited in claim 26 in which prior to said varying the contour of said occlusal surface of said member portions of said occlusal surface of said member are provided with a relatively thick wall, and in which for varying the contour of said occlusal surface of said member an exterior part of said portion of increased wall thickness is ground off.

32. The method as recited in claim 31 in which for providing said relatively thick wall the inner surface of said member at said occlusal surface is displaced inwardly.

33. The method as recited in claim 31 in which for providing said relatively thick wall material is plated on the exterior of said occlusal surface.

34. The method as recited in claim 26 in which said occlusal surface includes a cusp, and in which for said varying the contour of said occlusal surface an instrument is applied to the exterior of said cusp for bending said cusp.

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ROBERT PESHOCK, Primary Examiner